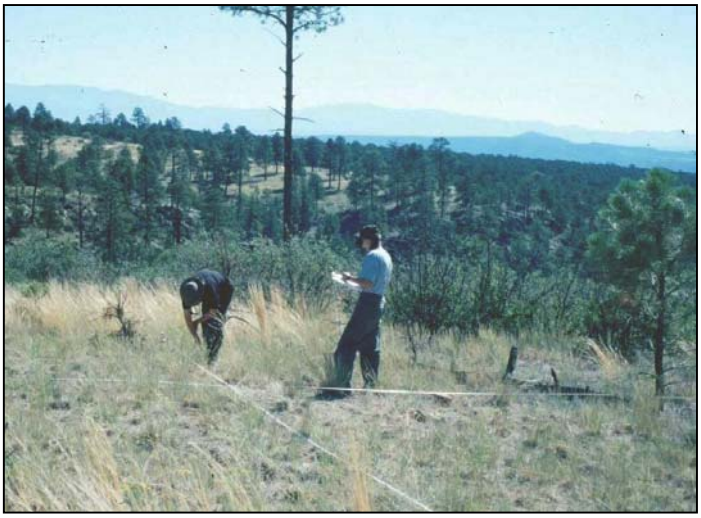
Vegetation – Shrub and Herbaceous Layer



This document describes methods for monitoring changes in shrub and herbaceous layer density and cover in grassland, brush or shrubland, woodland, and forest areas. Observations for shrub and herbaceous cover occur along permanently marked point intercept transects of adjustable length and number. Species intercepted and height of tallest vegetation are recorded. Observations for shrub density occur in permanently marked belt transects of adjustable width, length, and number, where individuals or stems are tallied by species and age class (seedling/immature, mature, resprout). Herbaceous vegetation density observations occur in quadrats of adjustable size and shape along permanently marked transects where individuals are tallied by species. The methods were developed for the National Park Service's (NPS) fire monitoring program but may be adapted for other monitoring purposes. For background information on the fire monitoring program, including the purpose and overview of the program, related policy, and personnel responsibilities, refer to Chapter 1, pages 1-5 of the NPS Fire Monitoring Handbook (FMH, http://www.nps.gov/fire/fmh/FEMHandbook.pdf). An overview of management objectives and the process for developing corresponding monitoring program objectives is reviewed in Chapter 3, pages 19-32 of the FMH.

Sampling design, including defining the population of interest, pilot sampling, calculating minimum sample size, and addressing potential design problems, is described in FMH Chapter 4, pages 33-54. Methods for generating and selecting plot locations and installing plots are found in FMH Chapter 5, pages 59-79. The schedule for monitoring prior to and following fire treatment is located in FMH Chapter 5, pages 55-58, although the schedule may be revised for other purposes. For a list of field equipment needs recommended for implementing this protocol, see FMH Appendix E, pages 221-224. Information about monitoring program file maintenance and data storage is found in FMH Chapter 5, pages 112-113. To review data quality procedures, see FMH Chapter 5, pages 114-117.

The field methods for the protocol described below are taken from FMH Chapter 5, pages 80-90 (http://www.nps.gov/fire/fmh/FEMHandbook.pdf). Specific forms developed for field data collection follow the protocol description.

Monitoring Vegetation Characteristics

ALL PLOT TYPES

This section describes specific methods for data collection. Each variable may be sampled in various levels of intensity depending on the monitoring type characteristics. These protocols are predetermined for each monitoring type; sample each variable the same way for every plot within a monitoring type (see page 43). Before you begin data collection, refer to the Monitoring type description sheet (FMH-4) and review the exact protocols to be followed for each specific monitoring type. For quick reference, use the Forest plot data sheet (FMH-7) to record and shade in the sampling areas for overstory, pole-size and seedling trees; see previous page.

Accuracy Standards

Accuracy standards for each variable are listed at the end of each subsection of this chapter.

Form Headings

Fill out the form heading completely. Record the monitoring plot ID code, whether it is a burn plot (B) or a control plot (C), the date the data were collected, the burn unit name or number, the names of the data collector and recorder (in that order), and the burn status (with the first two digits referring to the treatment number, and the last four letters and numbers referring to the visit relative to the last treatment). For example, 01 yr02 refers to a year-2 data collection visit the next sampling season after the first burn or other treatment (thinning, etc.), 03 Post refers to the immediate post-burn data collection following the third burn or other treatment. Preburn data are always coded 00 PRE, but if preburn data are updated before the first burn, the code for the original preburn data in the database will change to 00 PR01. If preburn data are collected a third time before the plot burns, the second preburn data will be re-coded 00 PR02 and so on. The code 00 PRE is always used for the newest set of preburn data.

Streamlining the Form Filling Process

Fill out form headings (minus the date and recorders) and other transferable information (fuel transect azimuths, tree tag numbers, etc.) before you go into the field. Forms can be assembled for each plot during slow periods in the office, during bad weather, or when there is a little extra time.

Before You Visit a Previously Established Plot

Use the Plot maintenance log (FMH-25) to document any items that you notice during a plot visit that need to be attended to during the next plot visit. Once you establish a plot, maintain the plot log and update it after each visit. By reviewing this log before visiting the plot, you can gather the necessary items to "fix" the problem noted previously. This form provides a reliable method of communication with monitors of the future. Examples of plot maintenance needs: replacement of a tag that was missing on the last visit, a missing rebar, or verification of a species identification.

HERBACEOUS AND SHRUB LAYERS

RS Procedures

Use form FMH-16 for 30 m transects or FMH-15 for 50 m transects (both are found in Appendix A). Use a point intercept method to record the number of transect hits and to obtain relative and percent cover by species over time. On forest and brush plots, also measure shrub density within a brush belt for the same distance, along the same transect. The collection of voucher specimens is strongly recommended; this is discussed on page 87.

Be Kind to the Fragile Herbage, Fine Fuels and Soils Beneath Your Feet

In order to minimize the effect of trampling on the data, stay outside the plot as much as possible, and sample forest types in the following sequence:

- Lay out tapes
- Photograph plot
- Collect herbaceous and shrub data, and fuels data (decide which layer is the most fragile, and collect those data first)
- Collect seedling tree data
- Collect overstory and pole-size tree data

Avoid heavy boots in favor of light shoes; set down sampling equipment, backpacks etc., to the side or below the plot, not in or above it; and minimize the number of people working in the plot. Additionally, use extreme caution on steep slopes.

Herbaceous and Shrub Layer Accuracy Standards

Accuracy standards for each variable discussed in this section are listed at the end of this section (Table 16, page 90).

Locate the 0 point on the point intercept transect
The data collection starting point is at the 0P (origin stake) on grassland and brush plots, and the Q4 (and possibly Q3 and 0P) on forest plots. The length and number of transects is determined during the monitoring design process (Chapter 4). Check your protocols on the Monitoring type description sheet (FMH-4) before proceeding.

Collect number of transect hits—grassland, brush and forest types
Start 30 cm from the 0P or Q4. Drop a ¼ in diameter pole (a rigid plumb bob), graduated in decimeters, gently so that the sampling rod is plumb to the ground (on slopes this will not be perpendicular to the ground), every 30 cm along the transect line. Where the transect length is 30 m, there will be 100 points from 30 to 3,000 cm. On forest plots where the transect is read along the full 50 m, there will be 166 points from 30 to 5,000 cm. In either case, the first intercept hit is at 30 cm, not at 0.

At each "point intercept" (Pnt), gently drop the pole to the ground, and record each species (Spp) that touches the pole on the appropriate data sheet (FMH-16 for grassland and brush plots, FMH-15 for most forest plots, and FMH-16 for forest monitoring types that use only the Q4–30 m line). Count each species only once at each point intercept even if the pole touches it more than once. Record the species from tallest to the shortest. If the pole fails to intercept any vegetation, record the substrate (bare soil, rock, forest litter, etc. (see Table 15, page 86)). **Note:** You can occasionally find vegetation under a substrate type; in this case you would ignore the substrate and record the vegetation. If the rod encounters multiple types of substrate, record only that which the pole hits first.

Do not count foliage or branches intercepted for trees over 2 m tall, but count all other vegetation, including shrubs, no matter its height. (This is because trees are better sampled using other procedures, and the target variables using the point intercept transect are shrubs and herbs.) If the sampling rod intersects the bole of a tree that is over 2 m tall, record "2BOLE," or "2SDED" if the tree is dead. **Note:** Record species not intercepted but seen in the vicinity (in a belt on either side of the brush and herbaceous layer transect) on the bottom of the data sheet (FMH-15 or -16). The width of this belt is specified on your Monitoring type description sheet (FMH-4).

Note: If you have selected to use the point intercept method to calculate basal cover (see page 46), record only the bottom hit for each point, regardless of whether it is substrate or vegetation.

Sampling Rods

A useful sampling rod can be made in any of several ways. Choose one that best suits your needs (see Table 12, page 82). One-dm markings can be made with an engraver, then filled in with a permanent marker; road paint and road sign adhesives can also be useful. Note that surface marking with most pens or paints wears off quickly, and many adhesives get gooey in the heat.

Table 12. Types of sampling rods.

Pole Type	Pros	Cons
Fiberglass Rod: This is the preferred choice.	Moderately available (your maintenance shop may already have some, or you can buy a bicycle whip (remove the flag)), moderate in price, lightweight, easy to carry, can be screwed together to adjust size and all pieces need not be carried if not needed, very durable.	None to note.
Tent Pole: Fiberglass with shock cord. This is the second choice.	Readily available (sporting good store), moderately priced, lightweight, foldable, durable.	Possibly hard to find 0.25" diameter, shock cord can break.
Steel Rod:	Readily available (hardware stores), moderately priced, extremely durable.	Bend, heavy, difficult to carry in the field.
Wooden Dowel:	Readily available (hardware stores), cheap, lightweight.	Fragile, inconvenient to carry.

Tall Vegetation Sampling Problems

If your protocols (FMH-4) require you to record height and the vegetation is **unexpectedly** taller than the sampling rod, try dropping the rod at the sampling point, then placing your hand at the 1 or 1.5 m point on the rod and sliding the rod up (without looking up), elevating it by 1 or 1.5 m and recording where it touches the vegetation above you. If the vegetation is consistently taller, find a taller sampling rod.

Dead Herbaceous and Shrub Species Sampling Problems

You may encounter dead standing vegetation along your transects. Always record dead **annual** vegetation in the same way you record live individuals. Record dead **biennial** and **perennial** vegetation (except dead branches of living plants) by placing a "D" at the end of the species code. This permits dead vegetation to be treated separately from live vegetation. Dead perennials may not be included in species abundance indices, but their presence may provide information for estimating fire behavior and determining mortality. In general (see the warning box below for exceptions) count **dead branches of living plants** as a live intercept. In the case of shrub and herbaceous species, this also applies if the main plant is dead but sprouting, and the dead part is encountered.

Counting Dead Branches of Living Plants as Dead (Optional)

In some cases, such as where animal habitat or aerial fuels are a concern, you may want to know the cover of dead branches, regardless of whether they are attached to living bases. If your monitoring type requires it, you may count dead branches of living plants as dead. However consistency is essential—if transects were not initially read this way for a monitoring type, a change "midstream" will cause an apparent dip in the cover of live shrubs that is not necessarily true.

Sprouting Dead Trees

Trees under 2 m tall: If the bole (>2 m tall) is dead but sprouting at the base, consider any live sprout (<2 m tall) you encounter as live.
Trees over 2 m tall: If you encounter a live basal sprout over 2 m tall, the sprout should be considered a tree (2BOLE) in its own right.

Optional Monitoring Procedures

Shrub and herbaceous layer height

At every sampling point, measure the height of the tallest living or dead individual of each species (to the nearest decimeter, in meters) at the highest place on the sampling rod touched by vegetation. Record this height (Hgt) on FMH-15 or -16. A ¼ in wide sampling rod graduated in decimeters should make this measurement relatively easy. Do not record data for aerial substrate such as the leaves or stems attached to a dead and downed tree.

Record Species Codes

Species codes are assigned in a systematic way following Natural Resource Conservation Service methodology, as used in the USDA PLANTS Database (USDA NRCS 2001). For existing programs, see the warning box below. This naming convention uses a 4–7 character alpha code beginning with the first two letters of the genus name and the first two letters of the species name. The following 0–3 characters are assigned as needed to avoid confusion of plants with duplicate codes. If there is no subspecies or variety, the next character(s) may not be needed or will simply be a one or two digit number representing the alphabetical ranking of that plant on the national list.

Examples:	
DACA	Dalea californica
DACA3	Danthonia californica
DACA13	Dasistoma calycosa

If the plant is a subspecies or variety, then the character in the fifth position will be the first letter of that infraspecific name, and if there are duplicates, a number will follow.

Examples:	
ACRUT	*Acer rubrum* var. *trilobum*
ACRUT3	*Acer rubrum* var. *tridens*
DACAP	*Dalea carthagenensis* var. *portoricana*
DACAP3	*Danthonia californica* var. *palousensis*

Assigning Species Codes

If you have an existing monitoring program it is not necessary to look up every species in your Species code list (FMH-6). The FMH.EXE software will convert your species codes for you.

If you are starting a new program, simply enter the genus, species, and infraspecific name (if appropriate) into the FMH.EXE software, and the software will look up the species code for you.

When you add a new species to the database, you must note certain other information as well. This includes the species code, its lifeform (see the warning box below) the full name, whether the species is native or non-native, and whether it is annual, biennial, or perennial. This information is recorded on the Species code list (FMH-6).

Life Form

Life form categories and their codes are as follows; see Glossary for full definitions.

A - Fern or fern ally	S - Shrub
F - Forb	T - Tree
G - Grass	U - Subshrub
N - Non-vascular	V - Vine
R - Grass-like	* - Substrate

Blank - Unknown, non-plant

Note: If blank is selected, you may also leave the following codes blank—whether the species is native or non-native, and whether it is annual, biennial, or perennial.

The FMH-6 serves as a running list of species codes. Keep only one list for the entire monitoring program in a given park, to avoid assigning incorrect codes. You should carry this sheet whenever you are collecting data, and you should refer to it every time you assign a species code. If you are unsure of the official code for a new plant (see page 83 for coding guidelines), assign a temporary code, then correct it on your data sheets and species list once you look up the official code. Once you enter the initial data into the FMH software (Sydoriak 2001), you may print out the Species code list from the database. Using this form will keep the

same code from being used for two different species, and will greatly facilitate data processing.

Dealing with unknown plants

Use an identification guide to make every attempt to identify every plant to the species (and subspecies or variety) level. If you cannot identify a plant because you need to have specific parts (e.g., flowers, fruits, etc.) not available during your sampling time (see page 199 for guidance on identifying dead and dormant plants), or you need to use a dissecting scope, take steps to allow future identification. Collect the plant (**from off the plot**), label it, describe it in detail, and then press it (see page 193 for guidelines on voucher collections). Assign an unknown code that is unique from all other unknown codes in the park and note a detailed description of the plant.

ALWAYS collect (or draw) and describe unknowns in the field, so that future field technicians will record the same unknown with the same code.

Management of unknown species can easily get out of hand, especially if there is a turnover of monitors from year to year, the flora is particularly diverse and complex, monitors are overworked or monitors lack the requisite plant identification skills. The remedies for these conditions are obvious: try to retain monitors from year to year, stress good documentation and quality, hire monitors who are trained in plant identification, and be realistic about their workload. But even under the best of circumstances, you will encounter the occasional unknown species.

Here are some tips that may help you keep your unknowns straight and get them identified.

- Keep meticulous notes including a detailed, botanical description of all the plant parts, location and micro-habitat, as well as any guesses as to genus or species.

Example:

Plants are herbaceous, 15–25 cm tall (but have been browsed) with several stems originating from the base. Leaves are 2–3 cm long, 0.5–1 cm wide, alternate, oblanceolate with finely dentate margins, glabrous above and tomentose below. Leaf tips are acuminate. No fruits or flowers are present. Plant is occasional in light openings in the ponderosa pine understory.

- Collect the plants (off the plot) and sketch if necessary.
- Make vouchers for the herbarium, but be sure to also make a set of field reference vouchers for unknowns.
- Refer to the vouchers or field reference often throughout the season to see if last year's unknown is this year's well-known friend.
- Keep a list of unknowns with notes as to why they were not able to be identified. Review the list in the early season and make a special trip to try to get the plants that were encountered after they had flowered and fruited.
- Scout around in similar areas for other individuals that may be more easily identifiable.
- Ask an expert, in park or out. Botanically-minded folk from a nearby university or the local native plant club are usually more than happy to help. Also consider taking digital photos and distributing them over the Internet to groups who have botanical expertise.

Assign each unknown plant a unique code; make every effort to match up duplicates of the same unknown. The PLANTS database has a series of default codes for unknowns (Table 13), and genera (see database (USDA NRCS 2001)). If you have more than one unknown (whether vascular or non-vascular) that matches the code of the category or where you can only key it to genus, then add a number to the codes as shown below. **Note:** Some genera have numbers at the end of their codes; always check the PLANTS database to be sure that the code you intend to use is not used by another genus or species. In the example below, the code for *Dryopteris* is DRYOP, however the code DRYOP2 is used for *Dryopetalon*, so monitors had to use numbers starting with 3 to avoid conflicts.

Examples:	
2GLP1	for unknown perennial grass number 1 (a densely tufted grass, with basal and cauline flat spreading leaves, hairy ligules)
2GLP2	for unknown perennial grass number 2 (a loose rhizomatous grass, with rolled basal and cauline leaves, no ligules)
DRYOP3	for unknown *Dryopteris* number 1 (petioles less than one quarter the length of the leaf, blade elliptic, 2-pinnate, marginal teeth curved, growing on limestone)
DRYOP4	for unknown *Dryopteris* number 2 (petioles one-third the length of the leaf, scales with a dark brown stripe; blade deltate-ovate, 3-pinnate, pinnule margins serrate)

Table 13. Species codes for unknown vascular plants.

2FA	Forb, annual
2FB	Forb, biennial
2FD	Forb, dicot
2FDA	Forb, dicot, annual
2FDB	Forb, dicot, biennial
2FDP	Forb, dicot, perennial
2FERN	Fern or Fern Ally
2FM	Forb, monocot
2FMA	Forb, monocot, annual
2FMB	Forb, monocot, biennial
2FMP	Forb, monocot, perennial
2FORB	Forb (herbaceous, not grass nor grasslike)
2FP	Forb, perennial
2FS	Forb, succulent
2FSA	Forb, succulent, annual
2FSB	Forb, succulent, biennial
2FSP	Forb, succulent, perennial
2GA	Grass, annual
2GB	Grass, biennial
2GL	Grasslike (not a true grass)
2GLA	Grasslike, annual

Table 13. Species codes for unknown vascular plants. (Ctd.)

2GLB	Grasslike, biennial
2GLP	Grasslike, perennial
2GP	Grass, perennial
2GRAM	Graminoid (grass or grasslike)
2GW	Grass, woody (bamboo, etc.)
2PLANT	Plant
2SB	Shrub, broadleaf
2SD	Shrub, deciduous
2SDB	Shrub, deciduous, broadleaf
2SDBD	Shrub, deciduous, broadleaf, dicot
2SDBM	Shrub, deciduous, broadleaf, monocot
2SDN	Shrub, deciduous, needleleaf
2SE	Shrub, evergreen
2SEB	Shrub, evergreen, broadleaf
2SEBD	Shrub, evergreen, broadleaf, dicot
2SEBM	Shrub, evergreen, broadleaf, monocot
2SEN	Shrub, evergreen, needleleaf
2SHRUB	Shrub (>.5m)
2SN	Shrub, needleleaf (coniferous)
2SSB	Subshrub, broadleaf
2SSD	Subshrub, deciduous
2SSDB	Subshrub, deciduous, broadleaf
2SSDBD	Subshrub, deciduous, broadleaf, dicot
2SSDBM	Subshrub, deciduous, broadleaf, monocot
2SSDN	Subshrub, deciduous, needleleaf
2SSE	Subshrub, evergreen
2SSEB	Subshrub, evergreen, broadleaf
2SSEBD	Subshrub, evergreen, broadleaf, dicot
2SSEBM	Subshrub, evergreen, broadleaf, monocot
2SSEN	Subshrub, evergreen, needleleaf
2SSN	Subshrub, needleleaf (coniferous)
2SUBS	Subshrub (<.5m)
2TB	Tree, broadleaf
2TD	Tree, deciduous
2TDB	Tree, deciduous, broadleaf
2TDBD	Tree, deciduous, broadleaf, dicot
2TDBM	Tree, deciduous, broadleaf, monocot

Table 13. Species codes for unknown vascular plants. (Ctd.)

2TDN	Tree, deciduous, needleleaf
2TE	Tree, evergreen
2TEB	Tree, evergreen, broadleaf
2TEBD	Tree, evergreen, broadleaf, dicot
2TEBM	Tree, evergreen, broadleaf, monocot
2TEN	Tree, evergreen, needleleaf
2TN	Tree, needleleaf (coniferous)
2TREE	Tree
2VH	Vine, herbaceous
2VHA	Vine, herbaceous, annual
2VHD	Vine, herbaceous, dicot
2VHDA	Vine, herbaceous, dicot, annual
2VHDP	Vine, herbaceous, dicot, perennial
2VHM	Vine, herbaceous, monocot
2VHMA	Vine, herbaceous, monocot, annual
2VHMP	Vine, herbaceous, monocot, perennial
2VHP	Vine, herbaceous, perennial
2VHS	Vine, herbaceous, succulent
2VHSA	Vine, herbaceous, succulent, annual
2VHSP	Vine, herbaceous, succulent, perennial
2VW	Vine, woody
2VWD	Vine, woody, deciduous
2VWDD	Vine, woody, deciduous, dicot
2VWDM	Vine, woody, deciduous, monocot
2VWE	Vine, woody, evergreen
2VWED	Vine, woody, evergreen, dicot
2VWEM	Vine, woody, evergreen, monocot

Make frequent checks of new unknowns against existing unknowns throughout the field season to avoid assigning the same code to two different species, or two different codes to the same species. Become familiar with your unknowns so that you can be on the lookout for the plant in a stage that is more easily identifiable. If the unknown is identified at a later date, the code (ex.: 2VWE1, etc.) must be corrected globally throughout your data sheets and in the FMH database. The FMH software will automatically change a species code in all databases when you change it on the FMH-6 data form.

Non-vascular plants

For the plants that you may have difficulty identifying, e.g., non-vascular plants like bryophytes, fungi, and algae, you can use broad codes as shown below.

Table 14. Species codes for non-vascular plants.

2AB	Alga, Brown
2AG	Alga, Green
2ALGA	Alga
2AR	Alga, Red
2BRY	Bryophyte (moss, liverwort, hornwort)
2CYAN	Cyanobacteria, cryptobiotic/cryptogamic/microbiotic/microphytic soil or crust
2FF	Fungus, fleshy (mushroom)
2FJ	Fungus, Jelly
2FR	Fungus, Rust
2FSMUT	Fungus, Smut
2FUNGI	Fungus
2HORN	Hornwort
2LC	Lichen, crustose
2LF	Lichen, foliose
2LICHN	Lichen
2LU	Lichen, fruticose
2LW	Liverwort
2MOSS	Moss
2PERI	Periphyton
2SLIME	Slime Mold

Dead or inorganic material

Dead or inorganic material should be coded in the following way (Table 15):

Table 15. Codes for dead or inorganic material.

2BARE	Bare ground, gravel, soil, ash; soil particles <1 in diameter.
2DF	Forest duff. Duff is the fermentation and humus layer. It usually lies below the litter and above mineral soil.
2LTR	Vegetation litter. Forest litter includes freshly fallen dead plant parts other than wood, including cones, bracts, seeds, bark, needles, and detached leaves that are less than 50% buried in the duff layer.
2LTRH	Litter, herbaceous
2LTRL	Litter, lichen

Table 15. Codes for dead or inorganic material. (Ctd.)

2LTRWL	Litter, woody, >2.5 cm
2LTRWS	Litter, woody, <2.5 cm
2RB	Rock, bedrock or mineral particles >1 in diameter.
2RF	Rock, fragments <1 in diameter.
2SC	Native, exotic, and feral animal scat.
2SDED	Standing dead tree.
2ST	Tree stump, no litter at intercept point.
2W	Water; permanent body of water or running water present six months of the year or more.

Make Voucher Collection

General protocols for collecting voucher specimens are included here; a detailed discussion on collecting, processing, labeling and preserving plant specimens is located in Appendix C. Collect vouchers when there is any doubt as to the identification of a plant species recorded in the data set, unless the species is threatened or endangered, or the plant cannot be found outside of the plot.

Identify specimens within two days. Prompt identification is essential for data accuracy, and saves time and money. For the initial phase of this monitoring program, collection of voucher specimens of all plants present is strongly recommended.

Collection of vouchers using the following guidelines (which are the same for all plot types) should enable consistent and correct identifications:

- Collect the voucher specimen off or outside of the monitoring plot. Collect enough of the plant to enable identification. Do not collect plants that are—or are suspected to be—rare, threatened, or endangered; sketch these plants and take pictures as vouchers.
- Press the plant materials immediately, but retain some unpressed flowers for easier identification.
- Record collection information on a form (see page 195) that you press with the voucher specimen.
- Keep all specimens in proper herbarium storage. See Appendix C for more information on proper herbarium storage.
- A field notebook of pressed specimens (including unknowns) is a very useful way to verify species identifications in the field.

Documenting Rare Plants

Do not collect a plant that is or may be rare, threatened, or endangered! Sketch or photograph these plants and substitute pictures for vouchers. In all cases your collection should follow the one in twenty rule: remove no more than one plant per twenty plants; remove no plants if there are less than twenty.

Voucher Label

The handbook now contains a voucher collection data sheet. You will find this data sheet on the back of the Species code list (FMH-6).

BRUSH AND FOREST PLOTS

Collect and Record Shrub Density Data

Record shrub density along a brush belt adjacent to the point intercept transect. The width of this belt is specified on your Monitoring type description sheet (FMH-4). Count each individual having >50% of its rooted base within the belt transect. For brush plots, the belt will be on the uphill side of the transect. When it is not clear which side of the transect is the uphill side, use the right side of the transect when viewed from 0P looking down the transect towards 30P. For forest plots, the belt will be inside the plot (Figure 22).

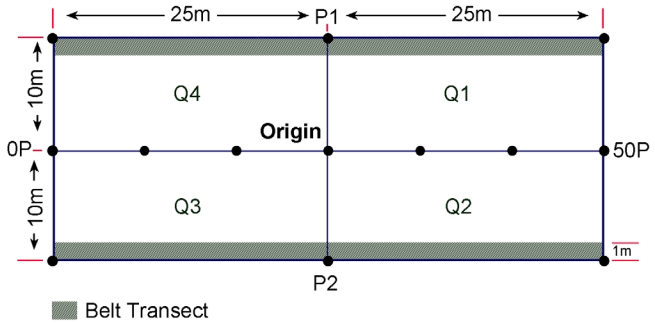


Figure 22. Belt transect for forest plots (see Figure 18, page 66, for stake codes).

Use the Shrub density data sheet (FMH-17) to record the data. You may divide the belt transect into 5 m intervals to facilitate counts. Number each 5 m interval from 1 to 6 (30 m), or 1 to 10 (50 m); interval 1 is from 0 to 5 m and so on. Record the interval (Int). Record data by species (Spp), age class (Age), whether it is living (Live), and number of individuals (Num) of that species. Tally any change in species, age, or live-dead as a separate entry on the data sheet, e.g., ARTR1, M, L,

would be tallied separately from ARTR1, M, D. Under age class, identify each plant as either a immature-seedling (I), a resprout (R), or as a mature-adult (M) (see Glossary for definitions).

Subshrubs in Shrub Density

Generally, shrub density data should not include data on subshrubs (see Glossary), unless there are specific objectives tied to density of those species. If you have objectives tied to subshrubs, use the herbaceous density sampling methods discussed below.

Troubleshooting Shrub Data Collection

Dead burls

After dead burls have been counted at least once since dying, you can omit them from density sampling, but it may be useful to note them on the form in case they sprout again in another year.

Clonal or rhizomatous species

Shrub individuals may be very difficult to define in some species, and monitors may get very different numbers depending on their perception of what an individual is. Relative or percent cover may be a more accurate way to describe these species. However, it may be appropriate to count something other than the individual in this case, e.g., a surrogate plant part such as culm groups, inflorescences, or stems.

Examples:

Arctostaphylos spp. stems are often easy to trace to a basal burl. This usually defines the individual. The "burl unit" may be an appropriate delineator of individuals, even when two or more individuals have grown together.

Vaccinium spp. are often rhizomatous, making it difficult to distinguish an "individual." The recommended response for dealing with rhizomatous or clonal species is to ignore these species when you collect shrub density data. **Note:** If these species are ecologically significant (e.g., for wildlife habitat), count stem density instead of individual density. The "stem unit," in this case, becomes the basis for quantifying density.

The usefulness of these surrogates depends on the biological significance of changes within these surrogates. Consult with resource and fire managers before you use a surrogate, or omit a species from shrub density sampling. Note any species for which you plan to use surrogates, or omit from monitoring, in the "Notes" section of the FMH-4.

Resprouts

Once a disturbance has caused a plant to die back and resprout, the plant should be considered a resprout for the first year, and then an immature until it is once again reproductive (mature).

Anticipated dramatic increases in postburn shrub density

It may be advantageous to establish a protocol to count seedlings in density plots only after their second or third year of survivorship. However, you should at least estimate seedling presence in all cases, with estimates such as $10/m^2$ or $50/m^2$.

You may wish to subsample the density plot during temporary high density periods. To subsample, grid the plot and randomly select an appropriate subsample (i.e., 10%, 20%) of the area. Then proceed to count the individuals in the subsample area and extrapolate to the sample area listed on your FMH-4. Again, this should be done only in consultation with resource and fire managers.

Optional Monitoring Procedures

Herbaceous layer species density

Grassland and brush plots—To measure the density of forbs and/or grasses, place a frame (the size and shape of which is determined during pilot sampling; see page 47) on the uphill side of the shrub and herbaceous layer transect every 10 m (unless you are using a belt transect because the vegetation is sparse). When it is not clear which side of the transect is the uphill side, use the right side of the transect when viewed from 0P looking down the transect towards 30P. It is important to record on the Herbaceous density data sheet (FMH-18) which side of the transect you sampled so future monitors will repeat your actions. The highest corner of the first frame would be at the 10 m mark, therefore, sampling frame 1 would fall between 6 and 10 m on the tape if you use a 0.25 × 4 m (1 m^2) frame; the next sampling areas would be between 16 and 20 m (frame 2), and 26 and 30 m (frame 3) (see Figure 23). The total area sampled using this example would be 3 m^2. Record these density data on the Herbaceous density data sheet (FMH-18).

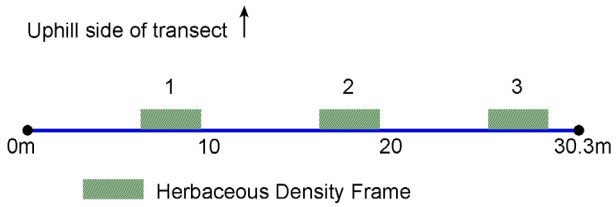


Figure 23. Density sampling frames (1 m^2) for herbaceous species in a grassland or brush plot.

Forest plots—For forest plots the procedure is the same as for grassland and brush plots; the only difference is frame placement. Place the frame on the plot side (interior) of the shrub and herbaceous layer transect (Q4–30 m or Q4–Q1 and/or Q3–Q2) every 10 m (unless you are using a belt transect because the vegetation is sparse). The highest corner of the first frame would be at the 10 m mark; therefore, the first sampling frame would fall between 6 and 10 m on the tape if you use a 0.25 × 4 m (1 m^2) frame; the next sampling areas would be from 16 to 20 m (frame 2), 26 to 30 m (frame 3) (stop here for Q4–30 m plots), 36 to 40 m (frame 4), and 46 to 50 m (frame 5). Repeat this process on the Q3–Q2 line in frame numbers 6–10, if you are reading the Q3–Q2 line with the point intercept transect (see Figure 24). The total area sampled using the above example would be 10 m^2 (5 m^2 sampled on each transect). Record these density data on the Herbaceous density data sheet (FMH-18).

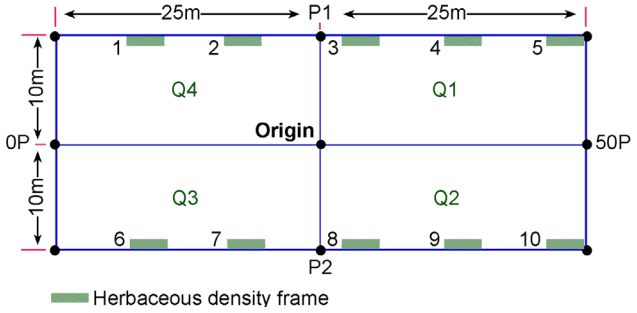


Figure 24. Density sampling frames (1 m^2) for herbaceous species in a forest plot.

Brush fuel load

Total biomass (fuel) and percent dead (live to dead ratio) may be determined in brush types with sufficient accuracy to make fire behavior predictions. When required for smoke management, total brush biomass must also be measured. Use standard biomass estimating techniques or existing species-specific estimating equations to determine fuel load.

Brush biomass

Use standard biomass estimating techniques or existing biomass estimating equations to estimate the biomass of each shrub in the plot. There are several other methods to estimate biomass, height-weight curves, capacitance meters, and double sampling; see Elzinga and Evenden 1997 under the keyword biomass for an excellent list of references, or review the references on page 237 (Appendix G).

Percent dead brush

There are three techniques to estimate percent dead brush: visual estimates; estimates based upon existing publications such as a photo series; or direct measurement of live-dead ratio using the following procedure:

- Randomly select a sample shrub of each species of concern within a 1 acre area, outside of your monitoring plot.
- Remove all branches 0.25 in or less in diameter, and place in separate airtight bags according to whether they are alive or dead. Take a subsample of the shrub if the shrub is very large.
- Determine the net weight of the live portion and the dead portion.
- Dry at 100°C.
- Determine oven dry weight of live portion and dead portion. Use a subsample if necessary. If you use a subsample, take care to weigh the sample and subsample at the same time before drying.
- After determining the dry weights separately, calculate the biomass in kilograms/hectare or tons/

acre for live and dead portions (see page 216, Appendix D).

Grass biomass

When smoke management is a specific concern, or hazard fuel reduction is the primary burn objective, you need to estimate biomass. For information on other methods see the note under "Brush Biomass" above. Use this procedure to qualitatively determine grass biomass:

Randomly toss a rigid quadrat of known area into the plot. Do this six times. Each time:

- Clip all the vegetation to within 1 cm of the ground.
- Place the clipped vegetation into paper bags. Each quadrat should have one bag.
- Label each container with the plot identification code, the bag number, and the collection date.
- Determine the sample dry weight by drying the material in their bags until the weight stabilizes. The oven temperature should be 100°C. Check your samples 24 hours after they have been in the oven.
- Calculate the kilograms/hectare or tons/acre for each sample (see page 216, Appendix D).

Table 16. Accuracy standards for herbaceous (RS) variables.

Herbaceous Layer		
Herbaceous Density	# of Individuals	± 5%
Shrub Density	# of Individuals	± 5%
Herb Height		± 0.5 decimeters

Park/Unit 4-Character Alpha Code: _____

FMH-15 **50 m TRANSECT DATA SHEET**

Plot ID: _____ B/C (Circle One) Date: ____/____/____

Burn Unit: _____ Recorders: _____

Burn Status:Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

00-PRE ____ Post ____-yr01 ___-yr02 ___-yr05 ___-yr10 ___-yr20Other: ___-yr____; ____-mo___

Phenological Stage:_____ (Circle One) Q4–Q1 w Q3–Q2 w 0P–50P

Pnt	Tape	Hgt (m)	Spp; Species or Substrate Codes (tallest to lowest)						
1	0.3								
2	0.6								
3	0.9								
4	1.2								
5	1.5								
6	1.8								
7	2.1								
8	2.4								
9	2.7								
10	3.0								
11	3.3								
12	3.6								
13	3.9								
14	4.2								
15	4.5								
16	4.8								
17	5.1								
18	5.4								
19	5.7								
20	6.0								
21	6.3								
22	6.6								
23	6.9								
24	7.2								
25	7.5								
26	7.8								
27	8.1								
28	8.4								
29	8.7								
30	9.0								
31	9.3								
32	9.6								
33	9.9								
34	10.2								
35	10.5								
36	10.8								
37	11.1								

Plot ID:_____ Date:____/____/_____ (Circle One) Q4–Q1 • Q3–Q2 • 0P–50P

Pnt	Tape	Hgt (m)	Spp; Species or Substrate Codes (tallest to lowest)						
38	11.4								
39	11.7								
40	12.0								
41	12.3								
42	12.6								
43	12.9								
44	13.2								
45	13.5								
46	13.8								
47	14.1								
48	14.4								
49	14.7								
50	15.0								
51	15.3								
52	15.6								
53	15.9								
54	16.2								
55	16.5								
56	16.8								
57	17.1								
58	17.4								
59	17.7								
60	18.0								
61	18.3								
62	18.6								
63	18.9								
64	19.2								
65	19.5								
66	19.8								
67	20.1								
68	20.4								
69	20.7								
70	21.0								
71	21.3								
72	21.6								
73	21.9								
74	22.2								
75	22.5								
76	22.8								
77	23.1								
78	23.4								
79	23.7								
80	24.0								
81	24.3								

Plot ID:_____ Date:____/____/_____ (Circle One) Q4–Q1 • Q3–Q2 • 0P–50P

Pnt	Tape	Hgt (m)	Spp; Species or Substrate Codes (tallest to lowest)						
82	24.6								
83	24.9								
84	25.2								
85	25.5								
86	25.8								
87	26.1								
88	26.4								
89	26.7								
90	27.0								
91	27.3								
92	27.6								
93	27.9								
94	28.2								
95	28.5								
96	28.8								
97	29.1								
98	29.4								
99	29.7								
100	30.0								
101	30.3								
102	30.6								
103	30.9								
104	31.2								
105	31.5								
106	31.8								
107	32.1								
108	32.4								
109	32.7								
110	33.0								
111	33.3								
112	33.6								
113	33.9								
114	34.2								
115	34.5								
116	34.8								
117	35.1								
118	35.4								
119	35.7								
120	36.0								
121	36.3								
122	36.6								
123	36.9								
124	37.2								
125	37.5								

Pnt	Tape	Hgt (m)	Spp; Species or Substrate Codes (tallest to lowest)						
126	37.8								
127	38.1								
128	38.4								
129	38.7								
130	39.0								
131	39.3								
132	39.6								
133	39.9								
134	40.2								
135	40.5								
136	40.8								
137	41.1								
138	41.4								
139	41.7								
140	42.0								
141	42.3								
142	42.6								
143	42.9								
144	43.2								
145	43.5								
146	43.8								
147	44.1								
148	44.4								
149	44.7								
150	45.0								
151	45.3								
152	45.6								
153	45.9								
154	46.2								
155	46.5								
156	46.8								
157	47.1								
158	47.4								
159	47.7								
160	48.0								
161	48.3								
162	48.6								
163	48.9								
164	49.2								
165	49.5								
166	49.8								

Species observed within ___ m of either side of the transect but not intercepted: _____

Park/Unit 4-Character Alpha Code: _____

FMH-16 **30 m TRANSECT DATA SHEET**

Plot ID: _____ B/C (Circle One) Date: ____/____/____

Burn Unit: _____ Recorders: _____

Burn Status:Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

00-PRE ____ Post ____-yr01 ___-yr02 ___-yr05 ___-yr10 ___-yr20Other: ___-yr____; ____-mo___

Phenological Stage: _____ (Circle One) Q4–30 m w 0P–30P

Pnt	Tape	Hgt (m)	Spp; Species or Substrate Codes (tallest to lowest)						
1	0.3								
2	0.6								
3	0.9								
4	1.2								
5	1.5								
6	1.8								
7	2.1								
8	2.4								
9	2.7								
10	3.0								
11	3.3								
12	3.6								
13	3.9								
14	4.2								
15	4.5								
16	4.8								
17	5.1								
18	5.4								
19	5.7								
20	6.0								
21	6.3								
22	6.6								
23	6.9								
24	7.2								
25	7.5								
26	7.8								
27	8.1								
28	8.4								
29	8.7								
30	9.0								
31	9.3								
32	9.6								
33	9.9								
34	10.2								
35	10.5								
36	10.8								
37	11.1								
38	11.4								
39	11.7								
40	12.0								
41	12.3								
42	12.6								
43	12.9								
44	13.2								
45	13.5								
46	13.8								
47	14.1								

Date Entered: ____/____/____

Pnt	Tape	Hgt (m)	Spp; Species or Substrate Codes (tallest to lowest)						
48	14.4								
49	14.7								
50	15.0								
51	15.3								
52	15.6								
53	15.9								
54	16.2								
55	16.5								
56	16.8								
57	17.1								
58	17.4								
59	17.7								
60	18.0								
61	18.3								
62	18.6								
63	18.9								
64	19.2								
65	19.5								
66	19.8								
67	20.1								
68	20.4								
69	20.7								
70	21.0								
71	21.3								
72	21.6								
73	21.9								
74	22.2								
75	22.5								
76	22.8								
77	23.1								
78	23.4								
79	23.7								
80	24.0								
81	24.3								
82	24.6								
83	24.9								
84	25.2								
85	25.5								
86	25.8								
87	26.1								
88	26.4								
89	26.7								
90	27.0								
91	27.3								
92	27.6								
93	27.9								
94	28.2								
95	28.5								
96	28.8								
97	29.1								
98	29.4								
99	29.7								
100	30.0								

Species observed within ___ m of either side of the transect but not intercepted: _____

Park/Unit 4-Character Alpha Code: ________

FMH-17 **SHRUB DENSITY DATA SHEET** Page __ of __

Plot ID: ______________________ B / C (Circle One) Date: ___/___/___

Burn Unit: ______________________ Recorders: ______________________

Burn Status:Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

00-PRE ___ Post ___-yr01 ___-yr02 ___-yr05 ___-yr10 ___-yr20Other: ___-yr___; ___-mo___

Transect: Q4–Q1 w Q3–Q2 w 0P–50P w Q4–30 m w 0P–30P (Circle One)

For living and dead plants within the transect, count each individual having >50% of its rooted base in the belt. The optional interval field (Int) can be used to divide the belt into subunits to facilitate species counts. Record Age Class (Age) code (see below).

Belt Width:____m Length:____m Side of transect monitored facing 30P (Brush Plots Only):________

Int	Spp	Age	Live	Num / Tally	Int	Spp	Age	Live	Num / Tally
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	
			Y N					Y N	

AgeClassCodes: **I** Immature–Seedling **R** Resprout **M** Mature–Adult

Date Entered: ___/___/___

Park/Unit 4-Character Alpha Code: ___________

FMH-17A

ALTERNATE SHRUB DENSITY DATA SHEET

Page __ of __

Plot ID: ______________________________ B / C (Circle One) Date: ____/____/____

Burn Unit: ________________________________ Recorders: ___________________________________

Burn Status:Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

00-PRE ____ Post ____-yr01 ___-yr02 ___-yr05 ___-yr10 ___-yr20Other: ___-yr___; ____-mo___

Transect: Q4–Q1 w Q3–Q2 w 0P–50P w Q4–30 m w 0P–30P (Circle One)

For living and dead plants within the transect, count each individual having >50% of its rooted base in the belt. The optional interval field (Int) can be used to divide the belt into subunits to facilitate species counts. Record Age Class (Age) code (see below).

Belt Width:____m Length:____m Side of transect monitored facing 30P (Brush Plots Only):________

Int	Spp	Age	Live	Num	Tally
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		

AgeClassCodes: **I** Immature–Seedling **R** Resprout **M** Mature–Adult

Date Entered: ____/____/____

Park/Unit 4-Character Alpha Code: ____________

FMH-18 **HERBACEOUS DENSITY DATA SHEET** Page ___ of ___

Plot ID: ________________________________ B / C (Circle One) Date: ____/____/____

Burn Unit: ________________________________ Recorders: ________________________________

Burn Status:Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

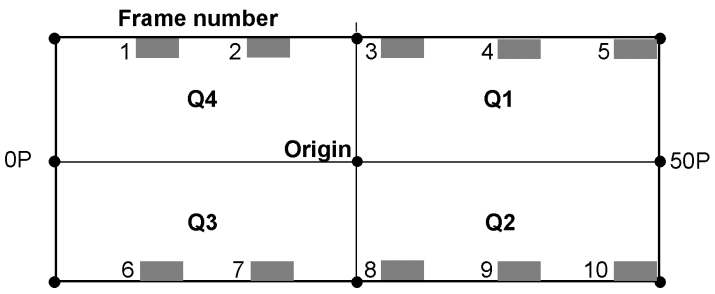
00-PRE ____ Post ____-yr01 ___-yr02 ___-yr05 ___-yr10 ___-yr20Other: ___-yr____; ____-mo___

Transect: Q4–Q1 w Q3–Q2 w 0P–50P w Q4–30 m w 0P–30P (Circle One)

For living and dead plants within the transect, count each individual having >50% of its rooted base in the sampling area.

Frame Size:______m² Side of transect monitored facing 30P (Brush Plots Only):__________

Frame #	Spp	Live	Num	Frame #	Spp	Live	Num
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	



Date Entered: ____/____/____

Frame #	Spp	Live	Num	Frame #	Spp	Live	Num
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	
		Y N				Y N	

Park/Unit 4-Character Alpha Code: _____

FMH-4 **MONITORING TYPE DESCRIPTION SHEET**

Monitoring Type Code: _____ Date Described: __/__/__

Monitoring Type Name: _____

FGDC Association(s): _____

Preparer(s) (FEMO/RMS/FMO): _____

Burn Prescription (including other treatments: _____

Management Objective(s): _____

Monitoring Objective(s):_____

Objective Variable(s): _____

Physical Description: _____

Biological Description:_____

Rejection Criteria:_____

Notes:_____

Date Entered: ____/____/____

PLOT PROTOCOLS

GENERAL PROTOCOLS		(Circle One)			(Circle One)	
Preburn	Control Treatment Plots (Opt)	Y	N	Herb Height (Opt)	Y	N
	Herbaceous Density (Opt)	Y	N	Abbreviated Tags (Opt)	Y	N
	OP/Origin Buried (Opt)	Y	N	Herb. Fuel Load (Opt)	Y	N
	Voucher Specimens (Opt)	Y	N	Brush Fuel Load (Opt)	Y	N
	Count Dead Branches of Living Plants as Dead (Opt)				Y	N
	Width Sample Area Species Not Intercepted But Seen in Vicinity of Herbaceous Transect(s):					
	Length/Width Sample Area for Shrubs:			Stakes Installed:		
	Herbaceous Frame Dimensions:					
	Herbaceous Density Data Collected At:					
Burn	Duff Moisture (Opt)	Y	N	Flame Depth (Opt)	Y	N
Postburn	100 Pt. Burn Severity (Opt)	Y	N	Herb. Fuel Load (Opt)	Y	N
	Herbaceous/Shrub Data (Opt): FMH- 15/16/17/18					

FOREST PLOT PROTOCOLS		(Circle One)			(Circle One)	
Overstory (>15 cm)	Live Tree Damage (Opt)	Y	N	Live Crown Position (Opt)	Y	N
	Dead Tree Damage (Opt)	Y	N	Dead Crown Position (Opt)	Y	N
	Record DBH Year-1 (Opt)	Y	N			
	Length/Width of Sample Area:			Quarters Sampled: Subset • Q1 • Q2 • Q3 • Q4		
Pole-size (≥2.5≤15)	Height (Opt)	Y	N	Poles Tagged (Opt)	Y	N
	Record DBH Year-1 (Opt)	Y	N	Dead Pole Height (Opt)	Y	N
	Length/Width of Sample Area:			Quarters Sampled: Subset • Q1 • Q2 • Q3 • Q4		
Seedling (<2.5 cm)	Height (Opt)	Y	N	Seedlings Mapped (Opt)	Y	N
	Dead Seedlings (Opt)	Y	N	Dead Seedling Height (Opt)	Y	N
	Length/Width of Sample Area:			Quarters Sampled: Subset • Q1 • Q2 • Q3 • Q4		
Fuel Load	Sampling Plane Lengths:___ 1 hr • ___ 10 hr • ___ 100 hr • ___ 1,000 hr-s • ___ 1,000 hr-r					
Herbaceous	Cover Data Collected at: Q4–Q1 • Q3–Q2 • 0P–50P • Q4–30 m					
Postburn	Char Height (Opt)	Y	N	Poles in Assessment (Opt)	Y	N
	Collect Severity Along: Fuel Transects • Herbaceous Transects					

(Opt) = Optional

Park/Unit 4-Character Alpha Code: _____

FMH-5 **PLOT LOCATION DATA SHEET**

Plot ID: _____ B / C (Circle One) Date: ___/___/___

Burn Unit: _____ Recorder(s): _____

Topo Quad: _____ Transect Azimuth: ____ Declination: _____

UTM ZONE: _____	Lat: _____	Section: _____	Slope (%) along Transect Azimuth: _____
UTMN: _____	Long: _____	Township: _____	Slope (%) of Hillside: _____
UTME: _____		Range: _____	Aspect: _____ Elevation: _____

Location Information Determined by (Circle One): Map & Compass / GPS

If determined by GPS: Datum used: _____ (Circle One) PDOP/EHE: _____

Fire History of the Plot (including the date of the last known fire):_____

_____

1. Road and trail used to travel to the plot:_____

_____

_____

2. True compass bearing at point where road/trail is left to hike to plot: _____°

3. Describe the route to the plot; include or attach a hand-drawn map illustrating these directions, including the plot layout, plot reference stake and other significant features. In addition, attach a topo, orthophoto, and/or trail map.

4. Describe reference feature: _____

5. True compass bearing from plot reference feature to plot reference stake: _____°

6. Distance from reference feature to reference stake: _____m

7. Problems, comments, notes:_____

_____

_____

FMH-5A **HISTORY OF SITE VISITS**

Plot ID: ________________ B / C (Circle One) Burn Unit: __________________________

Date	Burn Status	Purpose	Comments

Date Entered: ____/____/____

Park/Unit 4-Character Alpha Code: _____

FMH-6 **SPECIES CODE LIST** Page ___ of ___

Use this form to record unknowns and official species codes. **Tip:** Place an asterisk next to each species you voucher.

Species Code	Life Form	Genus/Species (spell out full name)	Native (Circle One)	Annual/ Biennial/ Perennial
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	

Life Forms Codes:

A	Fern or Fern Ally	**G**	Grass	**R**	Grass-like	**T**	Tree	*****	Substrate
F	Forb	**N**	Non-vascular	**S**	Shrub	**U**	Subshrub	**V**	Vine

Date Entered: ___/___/___

VOUCHER SPECIMEN DATA COLLECTION FORMS

Date: Plot ID: Collected by: Coll. #

Latin Name: Family:

Common Name:

Description: ann/bien/per Life form: ht.: Habitat:
flr. color: other:
fruit type:

Topo Quad: Assoc. spp.:

Location (UTM, lat/long): Elev.: Slope: Aspect:

Comments:

Date: Plot ID: Collected by: Coll. #

Latin Name: Family:

Common Name:

Description: ann/bien/per Life form: ht.: Habitat:
flr. color: other:
fruit type:

Topo Quad: Assoc. spp.:

Location (UTM, lat/long): Elev.: Slope: Aspect:

Comments:

Date: Plot ID: Collected by: Coll. #

Latin Name: Family:

Common Name:

Description: ann/bien/per Life form: ht.: Habitat:
flr. color: other:
fruit type:

Topo Quad: Assoc. spp.:

Location (UTM, lat/long): Elev.: Slope: Aspect:

Comments:

Date: Plot ID: Collected by: Coll. #

Latin Name: Family:

Common Name:

Description: ann/bien/per Life form: ht.: Habitat:
flr. color: other:
fruit type:

Topo Quad: Assoc. spp.:

Location (UTM, lat/long): Elev.: Slope: Aspect:

Comments:

Park/Unit 4-Character Alpha Code: _____

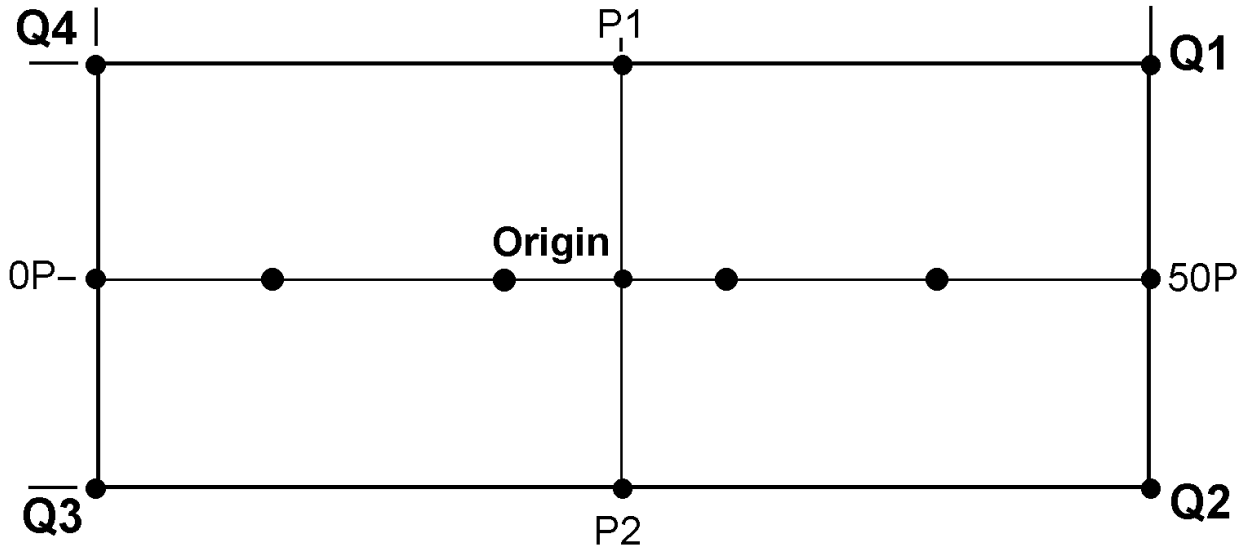
FMH-7 **FOREST PLOT DATA SHEET**

Plot ID: _____ B / C (Circle One) Date: ____/____/____

Burn Unit: _____ Recorders: _____

Burn Status:Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

00-PRE ____ Post ____-yr01 ___-yr02 ___-yr05 ___-yr10 ___-yr20Other: ___-yr___; ____-mo___



Overstory: _____m^2 in Q ____ Pole: _____m^2 in Q _____ Seedling: _____m^2 in Q ____

Sampling Areas: Shrub: _____m^2 along Q4–Q1 • Q3–Q2 • 0P–50P • Q4–30 m

Shade in the sampling areas for each tree class and for the shrub sampling area(s) on the plot layout above.

Photo Subject Order		**Fuel Load Transects**		
			Azimuth	Slope
1. 0P → Origin	6. Q2 → Q3			
2. Q4 → Q1	7. P2 → Origin	1		
3. P1 → Origin	8. Q3 → Q2	2		
4. Q1 → Q4	9. Origin → REF	3		
5. 50P → Origin	10. REF → Origin	4		

Record photo documentation data for each visit on FMH-23, Photographic record sheet

Draw in fuel load transect lines on the plot layout above.

Date Entered: ____/____/____